Robert Y. Lewis

Contact Info

Email: robert_lewis@brown.edu / rob.y.lewis@gmail.com
Website: http://robertylewis.com
Address: Brown University
Center for Information Technology 433
115 Waterman St
Providence, RI, USA 02912

Employment

2021 – Present **Brown University**, Providence, RI, USA
Lecturer, Computer Science

2018 – 2021 **Vrije Universiteit Amsterdam**, The Netherlands
Postdoc, Theoretical Computer Science

Summer 2016 **Wolfram Research**, Champaign, IL, USA
Intern, Mathematica Algorithms R&D

2010 – 2012 **St. Agnes Academy**, Houston, TX, USA
Secondary School Teacher
10th grade geometry, 11th and 12th grade pre-calculus, 12th grade AP Calculus AB

Education

2012 – 2018 **Carnegie Mellon University**, Pittsburgh, PA, USA
PhD, Pure and Applied Logic, 2018
MS, Mathematics, 2015
MS, Logic, Computation, and Methodology, 2014

Summer 2015 **University of Newcastle**, NSW, Australia
Visiting student, CARMA Priority Research Centre

2006 – 2010 **Rice University**, Houston, TX, USA
BA, Mathematics and Philosophy

Peer Reviewed Publications

A bi-directional extensible interface between Lean and Mathematica
Robert Y. Lewis and Minchao Wu
To appear in *Journal of Automated Reasoning*

Formalizing the ring of Witt vectors
Johan Commelin and Robert Y. Lewis
Hritcu, C. and Popescu, A., eds., *10th ACM SIGPLAN International Conference on Certified Programs and Proofs* (CPP 2021)

Normalizing casts and coercions
Robert Y. Lewis and Paul-Nicolas Madelaine
In Fontaine, Reummer, and Tourret, eds., *Practical Aspects of Automated Reasoning* (PAAR 2020)

Maintaining a library of formal mathematics
Floris van Doorn, Gabriel Ebner, and Robert Y. Lewis
In Benzmüller and Miller, eds., *13th Conference on Intelligent Computer Mathematics* (CICM 2020)

The Lean mathematical library
The mathlib Community
In Blanchette, J., Hritcu, C., eds., *9th ACM SIGPLAN International Conference on Certified Programs and Proofs* (CPP 2020), pp. 367-381. 2020
This paper describes a collective project with many contributors. I am a maintainer of the project and wrote much of this paper.

Formalizing the solution to the cap set problem
Sander Dahmen, Johannes Hölzl, and Robert Y. Lewis
In Harrison, J., O'Leary, J., and Tolmach, A., eds., *Interactive Theorem Proving* (ITP 2019), pp. 15:1-15:19. 2019

A formal proof of Hensel's lemma over the *p*-adic integers
Robert Y. Lewis
In Mahboubi, A., Myreen, M. O., eds., *8th ACM SIGPLAN International Conference on Certified Programs and Proofs* (CPP 2019), pp. 15-26. 2019

An extensible ad hoc interface between Lean and Mathematica
Robert Y. Lewis
In Dubois, C. and Paleo, B. W. eds., *Proof eXchange for Theorem Proving 2017* (EPTCS), pp. 23-38. 2017

A heuristic prover for real inequalities (journal version)
Jeremy Avigad, Robert Y. Lewis, and Cody Roux
Journal of Automated Reasoning 56(3), pp. 367-386. 2016

A heuristic prover for real inequalities
Jeremy Avigad, Robert Y. Lewis, and Cody Roux
In Klein, G. and Gamboa, R., eds., *Interactive Theorem Proving* (ITP 2014), pp. 61-76. 2014

Energy-minimizing unit vector fields
Leobardo Rosales, Robert Y. Lewis, et al
Involve 3(4), pp. 435-450. 2010

Books and Theses

Mathematics in Lean (a tutorial on the Lean theorem prover for mathematicians)
Jeremy Avigad, Kevin Buzzard, Robert Y. Lewis, and Patrick Massot
Under development; available online

Logic and Proof (a textbook using the Lean theorem prover)
Jeremy Avigad, Robert Y. Lewis, and Floris van Doorn
Available freely in interactive and static versions

Two Tools for Formalizing Mathematical Proofs (dissertation)
Robert Y. Lewis
Certified Feb 16, 2018

Polya: A Heuristic Procedure for Reasoning with Real Inequalities (MS thesis)
Robert Y. Lewis
Certified Dec 11, 2014

Teaching

Spring 2022	**Discrete Structures and Probability** (Brown)
Fall 2021	**Computing Foundations: Program Organization** (Brown, second instructor)
Fall 2021	**Formal Proof and Verification** (Brown)
Spring 2021	**Logic and Modeling** (VU, online)
Fall 2020	**Introduction to Computer Science (theory week)** (VU, online)
Spring 2020	**Logic and Modeling** (VU, online)
Spring 2019	**Logic and Modeling** (VU)
Spring 2018	**Logic and Modeling** (VU, teaching assistant)
Fall 2016	**Logic and Mathematical Inquiry** (CMU)
Spring 2015	**Nature of Mathematical Reasoning** (CMU)
Fall 2014	**Models and Methods of Optimization** (CMU, teaching assistant)
Summer 2014	**Nature of Mathematical Reasoning** (CMU)
Spring 2014	**Undecidability and Incompleteness** (CMU, grader and guest lecturer)
Fall 2013	**Formal Logic** (CMU, grader and guest lecturer)
2010 – 2012	**Geometry, Pre-calculus, AP Calculus AB** (St. Agnes Academy)
2007 – 2010	**Honors Calculus III/IV**, **Honors Linear Algebra** (Rice, grader)

Students

All students at VU Amsterdam.

2021	Polina Boneva (BS thesis)
2019	Kevin Kappelmann (MS intern)
2019	Paul-Nicolas Madelaine (MS intern)
2018 – 2019	Markos Dermitzakis (BS thesis)
2018 – 2019	Phillip Lippe (MS research assistant)
2018 – 2019	Miko Kuijn (MS thesis)
2018	Pablo Le Hénaff (MS intern)

Awards, Grants, and Honors

2021	Lorentz Center, hosting and organization for 45 person workshop
2020	Microsoft Research on Azure grant ($10k)
2019 – 2023	Senior Collaborator, Lean Forward NWO Vidi grant
2017	Laboratory of Symbolic and Educational Computation research fellowship
2017	Future Faculty, Eberly Center for Teaching Excellence & Educational Innovation
2015 – 2016	William S. Dietrich II Presidential PhD Fellowship
2014	Honorable Mention, NSF Graduate Research Fellowship Program

Service

2022	Organizer, Machine-Checked Mathematics workshop
2022	Intelligent Computer Mathematics Conference Program Committee
2021	Organizer, Lean Together 2021 workshop
2020	Proposal assessor, NWO Open Domain Science – XS scheme
2020	Certified Programs and Proofs 2021 Conference Program Committee
2020	Organizer, Formal Methods in Mathematics / Lean Together 2020 workshop
2019 –	Maintainer, Lean mathlib library
2019	Organizer, Lean Together 2019 workshop
2018	Organizer, ICMS session on Formal and Informal Mathematical Corpora
2018	Artificial Intelligence and Symbolic Computation Conference Program Committee
2015, 2016	CMU Philosophy Dept. Graduate Admissions Committee
2015	CMU Philosophy Dept. 30th Anniversary Conference Planning Committee
2014 – 2018	Founding member, CMU chapter of Minorities and Philosophy
2013 – 2017	Organizer, CMU Philosophy Dept. Graduate Research Sharing Forum
2011 – 2012	Coach and sponsor, St. Agnes Academy Engineering/Robotics Team
2008 – 2010	Coordinator and tutor, SRC Society of Academic Fellows, Rice University

Selected Presentations

Metaprogramming and tactic writing and **Dealing with numbers**

- Lean for the Curious Mathematician, virtual. 07/2020.

Simplifying casts and coercions

- PAAR 2020: Practical Aspects of Automated Reasoning, virtual. 06/2020.

The Lean mathematical library

- CPP 2020: Certified Programs and Proofs, New Orleans, LA, USA. 01/2020.

Formalizing the solution to the cap set problem

- ITP 2019: Interactive Theorem Proving, Portland, OR, USA. 09/2019.
- Vietnam-USA Joint Mathematical Meeting, Quy Nhon, Vietnam. 06/2019.
- CARMA Workshop on Computer-Aided Proof, Newcastle, NSW, Australia. 06/2019. (Invited speaker.)

A formal proof of Hensel's lemma over the *p*-adic integers

- CPP 2019: Certified Programs and Proofs, Cascais, Portugal. 01/2019.
- Lean Together 2019, Amsterdam, The Netherlands. 01/2019.

A heuristic method for formally verifying real inequalities

- Matryoshka 2018, Amsterdam, The Netherlands. 06/2018.
- Hales60, Pittsburgh, PA, USA. 06/2018. (Invited speaker.)

Toward AI for Lean, via metaprogramming

- AITP 2018: Artificial Intelligence in Theorem Proving, Aussois, France. 03/2018.

The Lean theorem prover, for mathematicians

- Western University Mathematics Dept. Foundations Seminar, London, ON, Canada. 12/2017.

An extensible ad hoc interface between Lean and Mathematica

- ICMS 2018: International Congress on Mathematical Software, South Bend, IN, USA. 07/2018.
- PxTP 2017: Proof eXchange for Theorem Proving, Brasília, Brazil. 09/2017.
- Wolfram Technology Conference, Champaign, IL, USA. 10/2016.

Automation and computation in the Lean theorem prover

- HaTT: Hammers for Type Theory, IJCAR, Coimbra, Portugal. 07/2016.
- AITP 2016: Artificial Intelligence in Theorem Proving, Obergurgl, Austria. 04/2016.
- TU München Logic and Verification Seminar, Munich, Germany. 03/2016.

Algebra and analysis in the Lean theorem prover

- MAP 2016: Effective Analysis, Marseille, France. 01/2016.

Dependent types and the algebraic hierarchy

- Workshop on Mathematics and Computation, Newcastle, NSW, Australia. 06/2015.

A heuristic prover for real inequalities

- ITP 2014: Interactive Theorem Proving, Vienna, Austria. 07/2014.
- 6th Podlasie Conference on Mathematics, Bialystok, Poland. 07/2014.
- CMU Graduate Research Sharing Forum, Pittsburgh, PA. 12/2013.

Energy-minimizing vector fields of unit length

- Rice University VIGRE Summer Seminar, Houston, TX. 07/2009.

Last updated: December 8, 2021